Question	Scheme	Marks
6(a)	E.g. $m=\dfrac{2-11}{8+4}$ or $m=\dfrac{11-2}{-4-8}$	M1
	$m=-\dfrac{3}{4}$	A1
		(2)
(b)	M is $\left(2,\ \dfrac{13}{2}\right)$	B1
	$m_N=-1\div"-\dfrac{3}{4}"$	M1
	$y-"\dfrac{13}{2}"="\dfrac{4}{3}"(x-"2")$	M1
	$8x-6y+23=0$	A1
		(4)
(c)	$AB=\sqrt{(-4-8)^2+(11-2)^2}\ (=15)$ or $AB^2=(-4-8)^2+(11-2)^2\ (=225)$	M1
	$\dfrac{1}{2}\times MC\times AB=37.5\Rightarrow MC=\dfrac{75}{15}\ (=5)$ or $MC^2=25$	M1
	$m_N=\dfrac{4}{3}, MC=5\Rightarrow\ C$ is $\left("2"-3,\ "\dfrac{13}{2}"-4\right)$ or $\left("2"+3,\ "\dfrac{13}{2}"+4\right)$	dM1
	$(-1,\ 2.5)$ **or** $(5,\ 10.5)$ **or** $x=-1,\ x=5$ **or** $y=2.5,\ y=10.5$	A1
	$(-1,\ 2.5)$ **and** $(5,\ 10.5)$	A1
		(5)
		(11 marks)

Notes

(a)

M1 Correct gradient method. Method must be correct for **both** the numerator and denominator.
Could also be solved by setting up two simultaneous equations and solving correctly.
ie $11=-4m+c \quad 2=8m+c \quad \Rightarrow 9=-12m\Rightarrow m=...$ (M1)

A1 Correct fraction or decimal (allow $\dfrac{-3}{4}$ or $\dfrac{3}{-4}$ or -0.75). If they find the equation of the line then they must identify $-\dfrac{3}{4}$ as the gradient.

(b)

B1 Correct midpoint. Allow unsimplified e.g. $\left(\frac{-4+8}{2},\ \frac{11+2}{2}\right)$. Coordinates can be just stated, seen in their working or they may appear on the diagram. Condone lack of brackets.

M1 Applies the perpendicular gradient rule to their gradient from part (a)

M1 Correct straight line method using their midpoint and a "changed" gradient. If using $y = mx + c$, must reach as far as $c = \ldots$.

A1 Allow any integer multiple

(c)

M1 Correct application of Pythagoras using the points A and B (or $\frac{1}{2}AB$ using M)

M1 Uses their AB and 37.5 correctly to find MC or MC^2. This may be implied by their working to find eg AM or BM

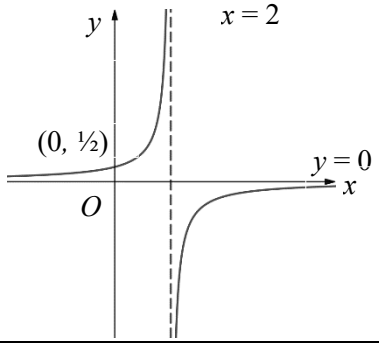
dM1 **Correct strategy** to find both x coordinates, or both y coordinates or a coordinate pair for the possible point C**.** To score this mark, look for sight of a linear or quadratic equation in one variable that would find either an x or a y coordinate for one of the possible pairs of coordinates for C. Condone slips in their rearrangements and they do not need to reach a value for either x or y for this mark.
Usually look for:

- Recognising that a distance of "5" for MC means by Pythagoras that $x = "2" \pm 3$ or $y = "\frac{13}{2}" \pm 4$. Alternatively, C is $\left("2" - 3,\ "\frac{13}{2}" - 4\right)$ or $\left("2" + 3,\ "\frac{13}{2}" + 4\right)$
  (If MC is not 5 look for application of Pythagoras.)
- Forming an equation of a circle with radius "5" from a point C and solving simultaneously with their l eg
  $(x - "2")^2 + (y - "\frac{13}{2}")^2 = "25"$ and $"8x - 6y + 23 = 0" \Rightarrow (x-2)^2 + (\frac{4}{3}x + \frac{23}{6} - \frac{13}{2})^2 = 25$ oe
  (they may form an equation in y).
- Shoelace method:
  $$\left|\begin{matrix} -4 & 11 \\ x & \frac{4}{3}x + \frac{23}{6} \\ 8 & 2 \\ -4 & 11 \end{matrix}\right| = \tfrac{1}{2}\left(-4(\tfrac{4}{3}x + \tfrac{23}{6}) + 2x + 88) - (11x + 8(\tfrac{4}{3}x + \tfrac{23}{6}) - 8)\right) = 37.5$$

It is dependent on **both of the previous method marks**. There may be other credit worthy methods so if unsure then send to review.

A1 $(-1, 2.5)$ **or** $(5, 10.5)$ (does not have to be written as coordinates)
or $x = -1,\ x = 5$ **or** $y = 2.5,\ y = 10.5$

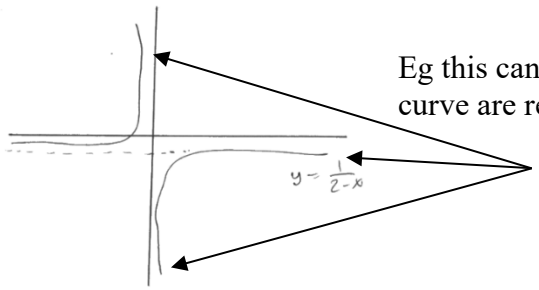
A1 $(-1, 2.5)$ **and** $(5, 10.5)$. Condone lack of brackets.
They may state the values for x and y but the coordinates must be paired correctly.

Question	Scheme		Marks
7(a)		B1 Negative reciprocal shape B1 Intercept at $\left(0, \frac{1}{2}\right)$ B1 $x=2,\ y=0$	B1B1B1
			(3)
(b)	$4x+k=\dfrac{1}{2-x}\Rightarrow(4x+k)(2-x)=1\Rightarrow 8x+2k-4x^2-kx-1(=0)$ oe $4x^2+(k-8)x+1-2k=0$ $a=4,\ b=k-8,\ c=1-2k$ or $a=-4,\ b=8-k,\ c=2k-1$ $(k-8)^2-4\times4(1-2k)(>0)$ oe $k^2-16k+64-16+32k>0\ \Rightarrow k^2+16k+48>0$*		M1 A1 M1 A1*
			(4)
(c)	$k^2+16k+48=0\Rightarrow(k+12)(k+4)=0\Rightarrow k=...$ $k=-12,\ -4$ $k<-12$ or $k>-4$		M1 A1 M1A1
			(4)
			(11 marks)

Notes

(a)

B1 Negative reciprocal shape (top left/bottom right sections) in any position on a set of axes with no clear vertical or horizontal 'overlaps'.
Condone slips of the pen as long as there is not a clear turning point, but it should not curve back on itself. If there are several attempts, then mark the last one. If there are contradictions between points stated in the text and any on the graph, then the graph takes precedence.



Eg this can score B1 for the correct shape. The ends of their curve are regarded as a slip of the pen